

[057]

CLAIMS:

What is claimed is:

- 1           1.     An audible alert device for generating a pulse width modulated  
2     signal, the audible alert device connectable to a power source, the audible alert  
3     device comprising:  
4           a circuit including a pulse width modulated signal generator; and  
5           a transducer conductively connected to the circuit.
- 1           2.     The audible alert device of Claim 1 further comprising the circuit and  
2     the transducer at least partially enclosed within a housing.
- 1           3.     The audible alert device of Claim 1 wherein the pulse width modulated  
2     signal generator further comprises:  
3           a first square wave frequency timer for generating a pulse width modulated  
4     signal;  
5           a second square wave frequency timer for generating a square wave; and  
6           a duty cycle controller for controlling a decibel output level of the transducer.
- 1           4.     The audible alert device of Claim 1 wherein the circuit further  
2     comprises a feedback signal processor conductively connected to the pulse width  
3     modulated signal generator.
- 1           5.     The audible alert device of Claim 1 further comprising:  
2           an output current sensor conductively connected to the transducer, for  
3     sensing a resistance at the transducer and generating a signal representative of  
4     transducer output current level;  
5           a feedback signal processor including;  
6           a feedback signal generator conductively connected to the output current  
7     sensor for generating a signal representative of transducer output current level; and

8 a resonant frequency peaking circuit for processing the signal representative  
9 of transducer output current level and generating a feedback signal representative of  
10 transducer output current level, the pulse width modulated signal generator  
11 responsive to the feedback signal to generate a pulse width modulated signal at a  
12 resonant frequency.

1 6. The audible alert device of Claim 1 further comprising:  
2 an output current sensor conductively connected to the transducer, for  
3 sensing a resistance at the transducer and generating an analog signal  
4 representative of transducer output current level;  
5 a feedback signal processor including;  
6 a feedback signal generator conductively connected to the output current  
7 sensor, the feedback signal generator including an analog to digital converter for  
8 converting the analog signal representative of transducer output current level to a  
9 digital value representative of transducer output current level; and  
10 a resonant frequency peaking circuit conductively connected to the pulse  
11 width modulated signal generator for processing the digital value representative of  
12 transducer output power level and generating a feedback signal representative of  
13 transducer output current level, the pulse width modulated signal generator  
14 responsive to the feedback signal to generate a pulse width modulated signal at a  
15 resonant frequency.

1 7. An audible alert device for generating a pulse width modulated  
2 signal, the audible alert device connectable to a power source, the audible alert  
3 device comprising:  
4 a transducer;  
5 a circuit including a power conditioning circuit conductively connected to the  
6 transducer; and  
7 a pulse width modulated signal generator conductively connected to the  
8 transducer, the pulse width modulated signal generator including a first square wave  
9 frequency timer for generating a pulse width modulated signal, a second square

10 wave frequency timer for generating a square wave and a duty cycle controller for  
11 controlling a decibel output level of the transducer.

1 8. The audible alert device of Claim 7 further comprising the circuit and  
2 the transducer at least partially enclosed within a housing.

1 9. The audible alert device of Claim 7 further comprising:  
2 an output current sensor conductively connected to the transducer, for  
3 sensing a resistance at the transducer and generating a signal representative of  
4 transducer output current level;  
5 a feedback signal processor including;  
6 a feedback signal generator conductively connected to the output current  
7 sensor for generating a signal representative of transducer output current level; and  
8 a resonant frequency peaking circuit for processing the signal representative of  
9 transducer output current level and generating a feedback signal representative of  
10 transducer output current level, the pulse width modulated signal generator  
11 responsive to the feedback signal to generate a pulse width modulated signal at a  
12 resonant frequency.

1 10. The audible alert device of Claim 7 further comprising:  
2 an output current sensor conductively connected to the transducer, for  
3 sensing a resistance at the transducer and generating an analog signal  
4 representative of transducer output current level;  
5 a feedback signal processor including;  
6 a feedback signal generator conductively connected to the output current  
7 sensor, the feedback signal generator including an analog to digital converter for  
8 converting the analog signal representative of transducer output current level to a  
9 digital value representative of transducer output current level; and  
10 a resonant frequency peaking circuit conductively connected to the pulse  
11 width modulated signal generator for processing the digital value representative of  
12 transducer output power level and generating a feedback signal representative of

13 transducer output current level, the pulse width modulated signal generator  
14 responsive to the feedback signal to generate a pulse width modulated signal at a  
15 resonant frequency.

1 11. A method for manufacturing an audible alert device includes the steps  
2 of:

3 manufacturing a programmable audible alert device circuit including a  
4 memory device;  
5 connecting the programmable audible alert device circuit to a transducer;  
6 installing the programmable audible alert device circuit and transducer in a  
7 housing;  
8 casting the programmable audible alert device circuit in a sealing fluid;  
9 connecting the audible alert device to a device programming station; and  
10 programming the audible alert device.

1 12. The method for manufacturing an audible alert device of Claim 11  
2 wherein the step of manufacturing a programmable audible alert device circuit  
3 includes manufacturing a circuit including a pulse width modulated signal generator  
4 conductively connected to the transducer, a power conditioning circuit conductively  
5 connected to the pulse width modulated signal generator, a power conductor,  
6 conductively connected to the power conditioning circuit, an output current sensor  
7 conductively connected to the transducer, a feedback signal processor connected to  
8 the output current sensor and a memory device conductively connected to the  
9 feedback signal processor.

1 13. The method for manufacturing an audible alert device of Claim 11  
2 wherein the step of connecting the audible alert device to a device programming  
3 station includes connecting the audible alert device to the device programming  
4 station by one or more power conductors of the programmable audible alert device.

1           14.    The method for manufacturing an audible alert device of Claim 11  
2 wherein the step of programming the audible alert device includes transferring  
3 operation mode data to the memory device, the operation mode data representative  
4 of pre-selected operation mode data selected from a group data for operating  
5 audible alert devices.

1           15.    The method for manufacturing an audible alert device of Claim 11  
2 wherein the step of programming the audible alert device includes transferring  
3 resonant peaking subroutine data to the memory device.

1           16.    The method for manufacturing an audible alert device of Claim 11  
2 wherein the step of programming the audible alert device includes transferring  
3 decibel peaking subroutine data to the memory device.

1           17.    The method for manufacturing an audible alert device of Claim 11  
2 wherein the step of programming the audible alert device includes conducting a  
3 resonant peaking subroutine.

1           18.    The method for manufacturing an audible alert device of Claim 11  
2 wherein the step of programming the audible alert device includes conducting a  
3 decibel peaking subroutine.

1           19.    A method for operation of an audible alert device in a normal  
2 operations mode includes the steps of:  
3           powering the audible alert device;  
4           monitoring an output current;  
5           conducting a dynamic resonant frequency peaking subroutine;  
6           conducting a dynamic decibel peaking subroutine ;  
7           initiating generation of a pulse width modulated signal; and  
8           outputting the pulse width modulated signal at a transducer.